Making Incremental Innovation Tradable in Industrial Service Settings

Abstract

How do organizations develop, buy and sell incremental innovation as a service? In many knowledge-intensive business-to-business settings the locus of interaction has shifted from stable, discrete, and articulated products and services to the exchange of somewhat nebulous capacities of problem-solving, innovation and R&D services. In these exchanges, tensions and conflicts between actors can arise in seeking clarity as to what is being exchanged and how it is valuable, while at the same time attempting to keep the interaction open for future adjustments to the scope and content of the exchange. We combine a longitudinal case study of a chemical services firm with Galison's (1999) concept of a trading zone and contributions in industrial services marketing to assess how actors offer, value and exchange incremental innovation. Focusing on the contentious nature of innovation processes, our contributions to the understanding of intra- and interfirm behavior in marketing and purchasing are threefold: (1) We examine how incremental innovation is formatted as a tradable service; (2) We explain how buyers, sellers and developers exchange the service of incremental innovation even when this service remains contentious in its specification; (3) We argue that trading zones complement relational processes and contractual arrangements by allowing actors to preserve their own logics and expertise pertaining to innovation.

Keywords: Incremental innovation, trading zone, exchange, industrial services

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1. INTRODUCTION

How do organizations buy and sell incremental innovation as a business service? Given the increase in knowledge-intensive business services such as R&D or consultancy services (Aarikka-Stenroos and Jaakkola 2012), this question is timely and under-researched. Actors' trading of innovation as a service can be particularly challenging given the often ambiguous and uncertain nature of the problems it aims to solve, actors' different resources and expertise, and their often conflicting interests in its production, exchange and use (Song, Dyer and Thieme 2006). The exchange of incremental innovation services requires buyers and sellers to agree on the service's qualities, value, and the terms and conditions of its exchange in the context of present and future unknowns (Araujo and Spring 2006). Debates around how to 'contract for innovation' may serve as an indication of just how complex and contentious this formatting in the face of continuous uncertainty at the buyer/seller interface can be (Gilson, Sabel and Scott 2009).

Offering innovation as a service requires a complex exchange, combining goods and services with commitments to making adaptations of these later and as required (Möller, Rajala and Westerlund 2008). Relationships between buyers and sellers are vital as the service is co-developed in the interaction by combining buyers' and sellers' resources (Kohtamäki, Partanen and Möller 2013; Zhang, Baxter and Glynn 2013). Developing an innovative capacity as a business service also requires strong internal collaboration as this capacity relies on the existence of specialist resources within the supplier firm that can be made available and recombined as needed, for instance between R&D's technical expertise and marketing's customer insights (Song et al. 2006; Foss, Laursen and Pedersen 2011; Kowalkowski et al. 2012).

The services and solutions marketing literature provides important leads on how actors prepare and deploy knowledge-intensive services, but places much less emphasis on the exchanges themselves and on the market arrangements that support the exchanges (Tuli, Kohli and Bharadwaj 2007; Song and Thieme, 2009; Kohtamäki, Partanen and Möller 2013; Kindström, Kowalkowski and Sandberg 2013). The service-dominant logic (SDL) makes a strong case for the co-development of offers and the co-creation of value, but only tentatively addresses the question of how exchanges play into co-creation (Cova and Salle 2008; Vargo and Lusch 2011). Innovation literature informs us that innovation needs to be open, adaptive, multi-agent, experimental and processual (von Hippel 1976; Pires, Dean and Rehman 2014). This research also points out that innovation processes are often pressurized and conflict-laden contexts, which likely exacerbates the problems associated with buying and selling them as business services (Song et al. 2006).

In order to address this gap around exchanges in our knowledge of service marketing and purchasing, we report on a longitudinal case study of suppliers and buyers of chemical services in the petroleum industry. We define incremental innovation as a service where producers draw upon established resources to work with users in identifying new products or services or adaptations of existing products or services in order to solve their problems (Gallouj and Weinstein 1997; Song and Thieme 2009). We assess how the companies develop, exchange and deploy innovation as a business service across heterogeneous projects and through different interactions internally and across their firms' boundaries. Following an abductive approach in combining our case study material and extant theory, we argue that the concept of 'trading zone' (Galison 1999) offers a potent basis for marketing and management researchers for assessing innovation as distributed and exchanged problem-solving within and across firms' boundaries.

According to Galison (1999), local zones of interaction, or 'trading zones', support exchanges between members of different cultures or specialisms – in Galison's study between theoretical and experimental physicists – and ensure the continuation of their difference over time, which offers the prospect of future mutual benefits through trade. A trading zone is not a physical infrastructure but rather a set of local processes focusing on exchange among groups involved in using one another's expertise. Drawing on the trading zone concept allows us to examine the often-contentious development and delivery of incremental innovation services across intra- and inter-firm actors. It also allows us to complement existing insights into the role of relationships and social capital among buyers and sellers with an emphasis on the exchange itself. We argue that trading zones fill an important function between contractual arrangements for fully specified technical interfaces and entirely implicit relational links in understanding the processes in which sales, marketing and technical development can be aligned with purchasing and use.

2. CONCEPTUAL BACKGROUND

2.1 The Management and Marketing of Innovation as a Service

Managing and marketing innovation as a business service requires coordination and integration across multiple parties, external and internal resources, actors and organizations (Lawrence and Lorsch 1967; Foss et al. 2011; Cantù, Corsaro and Snehota 2012). The contingencies of developing innovation as a service require close alignment between the 'sensing' and 'seizing' of opportunities (Kindström, Kowalkowski and Sandberg 2013). The marketing of innovation as a service can learn from research into service innovators, in which managers and marketers are agile and customer-centric, often relying on the insights of colleagues across multiple contact points such as sales, logistics and maintenance

(Kowalkowski et al. 2012). Möller et al.'s (2008) description of incremental service innovation for instance requires complex and lasting interfaces between supplier and customer and hints at a supplier's innovative capacity in itself becoming the service sold: "Successful client-driven innovation implies a client's ability to demand services and the service provider's ability to meet these requirements in incremental but continuous fashion" (p. 38). Examples include knowledge-intensive services such as consultancy, corporate banking, advertising or prototyping , which feature continuous problem solving and require extensive joint activities between buyers and sellers for solutions to be designed and value to emerge (Kohtamäki, Partanen and Möller 2013; Aarikka-Stenroos and Jaakkola 2012).

Incremental innovation as a business service is supported by firms developing social capital (Kohtamäki et al. 2013). Kindström et al. (2013, p. 1068) argue that relationships are a promising basis for assessing innovation opportunities as they materialize "over repeated cycles of interactive co-creation [with the customer]". SDL also talks about identifying, mobilizing and integrating resources for the co-creation of value as relationally embedded, extending to supplier and customer networks (e.g. Cova and Salle 2008; Vargo and Lusch 2011). However, while valuable in tracing the processes of co-creation, a focus on relationships and activities put to practice in value co-creation seem to render the exchanges themselves almost invisible. For instance, though Aarikka-Stenroos and Jaakkola's (2012) framework of supplier and customer roles in collaborative problem solving is comprehensive, none of the activities detailed refer to the commercial exchange itself.

Though we acknowledge the centrality of relationships in resource integration, we argue that given the characteristics of the good being traded, exchanges of incremental innovative capabilities can be particularly challenging and that attention should be given to these. Following Callon and Muniesa (2005), exchanging a service requires defining boundaries around and access to socio-technical capabilities – or drawing together resources from

different parties and also, importantly, formatting them for exchange. In the area of solution selling, Tuli et al. (2007) and Zhang et al. (2013) show how such resources or inputs are also interactive, becoming stable only in specific uses. Second, formatting a service as tradable extends beyond a firm and an immediate trading relationship to include valuations that guide exchanges, which similarly, are to be made stable (Araujo and Spring, 2006). Following Callon et al. (2002), we thus expect actors to engage in market-making work as well as product or service qualification work.

2.2 Trading Zones

We draw on literature on coordination mechanisms in management studies to understand exchanges of incremental innovation in market settings and as a business service. This literature indicates a division between coordination accomplished through the design of common ground or, as Andersen, Kragh and Lettl (2013) call it, 'close coupling', and allowing different work groups to engage in what we may call 'loose coupling' (Hsiao et al. 2012). In 'close coupling', specialization and difference are perceived as a problem to be dealt with through investment in mechanisms such as boundary objects or boundary spanners (Tushman, 1977; Star and Griesemer, 1989; Carlile, 2002; D'Adderio, 2001; Andersen et al. 2013). Similarly, salespeople have been described as boundary spanners and resource integrators in interorganizational relationships (e.g. authors 2009; Zhang et al. 2013).

By contrast, in 'loose coupling' difference and specialism are seen as qualities that allow companies to be innovative, agile and adaptive (e.g. Kellogg et al. 2006; Stark 2009). In 'loose coupling', groups remain at arms' length. This is particularly useful in situations where investment in formal coordination processes is prevented by time pressures or diverging organizational goals, such as in fast-moving industries (Girard and Stark 2002; Kellogg et al.

2006) or ‘skunkworks’ (Fosfuri and Rønde 2009). In such situations, coordination between groups of experts resemble exchange-like interactions, which management research has studied by drawing on Galison’s (1997, 1999) concept of trading zone.

Galison proposes the trading zone as a style of organizing that allows actors to ‘trade’ their expertise. Trade allows actors to make exchanges locally without needing to become intimately acquainted with one another’s expertise: “*Trade* focuses on coordinated, local actions, enabled by the *thinness* of interpretation rather than the thickness of consensus.” (2010, p. 36, original emphasis). This, in turn, supports the continuing development of specialist knowledge: like members of different tribes encountering each other in a local marketplace, when organizational actors make exchanges in a trading zone, they negotiate limited local agreements on the meanings and qualities of the exchange, irrespective of their global or cultural differences. We see parallels in international business research, in which Tippmann, Sharkey Scott and Mangematin (2012, p. 747) contrast problem solving that requires ‘local template adaptation’ with ‘global principle creation’. In Galison’s account, exchange facilitates access – in a restricted and local sense – to one another’s specialist knowledge and resources and thus makes it attractive to both trading parties.

In following Galison, organizational researchers have found his notion of trading zone helpful in accounting for complex problem-solving in volatile environments. Girard and Stark (2002) observed a new media firm thrive on the creative misunderstandings among heterogeneous actors, where the trading zone guides renegotiations of trade. In a fast-paced web marketing organization, Kellogg et al. (2006) demonstrated that trading zones allowed members of different groups and project teams to accomplish alignment of their work flexibly. Boland, Lyytinen and Yoo (2007) investigated trading zones between firms as companies translated ‘wakes’ of innovations across projects over time, and Vaughan (1999) examined how the simultaneous restrictiveness and openness of NASA’s dealings with

subcontractors while developing the Challenger spacecraft almost forcibly brought interpretive differences into the open.

In summary, management researchers have examined trading zones in situations where misalignment and multivocality is beneficial to an innovation process. In these accounts, actors maintain a trading zone as a process of flexible coordinating, recognizing the benefits of supporting a continuing diversity between groups. Turning to the field of marketing, the idea of trading zone presents a pronounced difference in emphasis to accounts such as Aarikka-Stenroos and Jaakkola's (2012) finding of intensive interactions in relational dyads or Kohtamäki et al.'s (2013) focus on social capital. Similarly, where Kindström et al. (2013) draw attention to dynamic capabilities developed and situated within a firm, Galison highlights a small number of re-usable arrangements situated in market-like spaces, which assist knowledge-intensive exchanges.

3. RESEARCH CHOICES

3.1 Research Design and Setting

The aim of our empirical investigation was to gain an understanding of how incremental innovation is traded in and across organizations. Hsiao et al. (2012 p. 466) encouraged researchers to observe "how experts actually collaborate in situ across boundaries", and Carlborg et al. (2014) called for process studies around service innovations. Heeding these calls, we adopted a single longitudinal case setting that would allow for deep immersion into patterns of interactions (Rosen 1991). We followed an abductive research approach, moving back and forth between our understanding of the themes emerging from literature and our empirical investigation (Dubois and Gadde 2002, Reichertz 2007).

We aimed to identify a case company engaged in incremental innovation and problem solving for its clients. After considering several firms, we negotiated and gained access to a product and service company, ChemCo, which supplies chemicals and chemistry services to oil companies to assist in production processes in the North Sea and elsewhere. ChemCo's service offering includes regular testing and monitoring of chemical products in use, diagnoses, recommendations for new products, and logistics to arrange for the timely delivery of the related products and services. It employs about 400 people globally and operates in all major upstream exploration and production locations world-wide.

The exchange of chemicals and chemistry services in the North Sea's upstream petroleum industry is characterized by the maturity of the oil and gas fields and by tightening regulation of the uses of chemicals offshore in the marine environment. Production under conditions of maturity has become a specialism among some smaller multi-national oil companies and service companies. Chemicals companies too have experienced a boost to their innovation profiles, as they have responded to the maturity of the oil facilities and to regulation that has mandated the use of chemicals with lower levels of impact on the marine environment. The industry and its ecosystem is notably focused on R&D, and joint industry projects are a regular occurrence.

3.2 Data sources

In 2007 we conducted a year-long field study of ChemCo and its customers, which extended into 2010 through follow-on meetings and interviews and reached back to 1998 through documentary evidence. We took exchanges to be our unit of analysis, pertaining to incremental innovation across work groups within the company and when buying, selling and deploying this innovative capacity across organizational boundaries. Initial interviews with senior managers and representatives from the technical and sales groups indicated that those groups encountered each other and their customers mainly through project work.

We decided to take ChemCo's projects database as a sampling frame in order to vary our insights into episodes of exchanges and to add 'replication logic' to our analysis (Yin 2003). Following theoretical sampling to maximize the diversity of observations (Glaser and Strauss 1967) we identified six projects, which contrasted in terms of chemical problem in question, differences in the projects' durations, and the commercial terms of exchange. Projects ranged from a routine request for a product formulation or chemical test, through incremental innovation projects, to sporadic episodes of radical innovation. Each project contained information on its initiator, projected sales value, scope of work, authorizations and budgets as well as an extensive email trail, timelines and documents. We examined each of the documents and emails and interviewed the ChemCo employees involved in the project. Our informants recommended a seventh project to complement our insights as we provided interim feedback. Thus, our findings are based on the interactions between the focal communities Technical, Sales, and Customers, and their encounters across a sample of seven projects as well as on a range of observations not specific to any particular project to complement our insights. Table 1 provides an overview of items in our data set, and Table 2 lists our interviewees across all projects.

[Table 1 and 2 about here]

3.3 Data analysis

We first analyzed our data for broad themes during on-going data collection in order to ascertain what further information may be required. After this initial reading, we individually analyzed the data line-by-line, using QSR NVivo as a data management tool and following an open coding procedure (Strauss and Corbin 1990). Content analysis was carried out on all project-specific documentation, which mainly consisted of email trails, directed at the structural information flow (who sent the email, to whom was it sent, who was copied). In addition, we analyzed a tender document from the year prior to our fieldwork commencing,

comprising four lever-arch files. After this initial coding process, we re-wrote the projects as case narratives, drawing on the complete data set for each project. This allowed us to assess what seemed to be common themes as these were manifest in particular cases. These empirical themes form the basis of our findings, presented in Section 4 below: formatting incremental innovation as a service; coordinating exchanges of incremental innovation; and resolving value conflicts.

Following the principles and templates of abduction (Reichertz, 2007; Aarikka-Stenroos and Jaakkola 2012), we subsequently compared and contrasted our empirical themes with the literatures on trading zones and service innovation in order to assess the relationship between our cases and the second-order or theoretically-informed constructs of: nature of the zone, innovation logics present, devices, zone work, difference in the zone, and how difference is overcome. We presented our interim findings on two occasions to ChemCo's senior managers, where missing relationships between patterns were identified and further data points suggested, and at a number of research gatherings to solicit feedback from colleagues familiar with the theoretical literature.

4. FINDINGS

Maturity in oilfield production facilities and evolving regulation have provided strong imperatives for chemists to offer incremental innovation as a business service to their oil company customers, and for oil companies to tender for this. ChemCo forefronts 'pro-active problem solving' and 'being innovative' as core offerings in its tender documents, its client promise and mission statement. Across our observations of projects and customer interactions, the issue of increasing value through innovative activities featured prominently. In this section we show how ChemCo's technical group, its sales group and oil-company customers resolve the question of exchanging innovation as a business service. We present

findings across our three empirical themes of: formatting incremental innovation as a service; coordinating exchanges of incremental innovation; and resolving value conflicts.

4.1 Formatting incremental innovation as a service

The projects outlined in Table 1 involve the exchange of incremental innovation in various guises, including the development of a new chemical, the adaptation of an established chemical, working through combinations of chemical treatments, offering a range of tests and resolving regulatory compliance. As summarized in Table 3, we identified considerable variety across the sample of projects undertaken by ChemCo. While innovation projects have different triggers and dimensions, more importantly their developers, sellers and customers have at times starkly different perceptions of the uncertainty and value inherent in these projects. The variety across projects raises the question of whether actors can devise a small number of common dimensions that allows their exchanges to be open to general or global processes.

[Table 3 about here]

Contractually, incremental innovation is written into Chemical Management Service contracts (or CMSs), usually awarded for 3 to 5 years by larger oil companies owning multiple oil fields. Procurement managers use CMSs to group together chemistry projects under work programs, as outlined in contract tender documents, negotiated by chemistry companies and oil companies annually, and reviewed on a quarterly basis. A CMS incentivizes chemistry companies to enhance their capacities to offer incremental innovation. Upon contract award, a chemicals company inherits an established program from the previous incumbent. As a CMS holder, the chemistry company is expected to propose enhanced treatments, as novel problems emerge and as the key account manager becomes

better acquainted with the customer's production facilities and plans. Where a CMS holder demonstrates improved performance or efficiencies over existing treatments, the oil company will switch to the new treatment, and the company will earn a mark-up on the chemical treatment in addition to the handling fee for arranging the logistics.

The requirement to propose "production improvement plans" across a series of projects shows the ways in which the award of a CMS contract is in part an attempt by oil companies to acquire and support the further development of the chemicals company's innovative capacity. A CMS is also an insurance mechanism, such that should oil companies have unanticipated technical problems, the contracted chemicals company will apply their capacity for incremental innovation as a matter of priority. In addition, to a large extent it outsources the oil firm's contact with environmental regulators who can require oil production chemicals to be substituted.

Despite these contractual and practical drivers toward innovation, local users – oil companies' asset managers – are risk-averse and tend to focus on the assurance of production flows. These users need compelling evidence to adopt incremental innovation, with the standards for tests, technical reports, executive summaries and recommendations accompanying chemistry solutions.

4.2 Coordinating the exchange of innovation

While CMS contracts were awarded infrequently and following detailed procurement processes, the work within and around the contracts was undertaken by sales, key account and business development personnel from ChemCo, supported by senior managers, and by production chemists, procurement and asset managers in the oil companies. Personal and corporate relationships were vital (Cova and Salle 2008; Kohtamäki et al. 2013), but ordering

projects required the design of stable and reusable processes and multiple tools that cut into and redirected those social relationships.

Within ChemCo, sales personnel formulated incremental innovation services for customers in the form of project proposals, requesting specific tasks from one of the Technical Group's specialist areas. A group leader then assessed this order, agreeing a timeline and a set of deliverables (for instance a report on lab and field tests, a recommendation, or a new product compliant with regulations). Senior managers across ChemCo's Technical, Sales and Purchasing departments approved and authorized projects after assessing these using a corporate value/risk matrix, which was designed to bring comparability to projects and prioritize them. The matrix consisted of three dimensions for each project: 'business risk', 'potential value' and a 'customer ranking'. Each dimension was ranked from 1 (low) to 8 (high), so providing an overall commercial evaluation of each project, and senior managers negotiated the scores at an early stage.

In reality, most of the Technical Group's work was organized and projects ranked through ChemCo's lab. The lab was a recent investment and was located a short distance from the established site where sales and production staff were located, which is a distinct change from ChemCo's early days of co-location on one site. ChemCo's sales personnel have some insight into technical work, as many have experience as applied chemists. Some innovation projects required 'will it work' kinds of tests that can be undertaken very quickly. Other tests take time, for instance in cases where regulation updates ban some established chemicals from being used in the future. Given the practicalities of coordinating available slots for lab equipment and specialists' time across a great diversity of projects, lab space often determined the order in which technicians worked through projects:

> I think that sometimes they [sales personnel] want the product without understanding the process. 'We want a green chemical, we want a product at the end of the week.'

> Once you get into weld tests and under-deposit tests, under-deposit tests should really take 28 days, and we have two kits. (Technical Group Leader)

To speed up this process, sales people occasionally lobbied the Technical Group for their clients' projects to be given additional resources or issued faster results, a behavior that was discouraged by Senior Management. In addition, the technical group had its own financial accountability across its personnel, space and facilities.

At the buyer/seller interface, key performance indicators (KPIs) played an analogous role to the risk and value matrix in ChemCo's projects database as sorting mechanisms for exchanges. The CMS contracts make provision for quarterly review meetings, which are forums to discuss the performance of the work program. For the largest customer (Oil1), asset managers completed scores across ten KPIs, and these were projected as key data at these meetings. Discussion concentrated on any notable changes in performance, for instance as successful substitutions of new products required by changes in regulation, speedy resolutions of unanticipated production problems, or delays in implementing an agreed work program.

4.3 Resolving Value Conflicts

The previous two sections demonstrated that the CMS contract and established relationships in combination provided for the formatting and exchange of a capacity of incremental innovation, and Technical, Sales and Customers devised processes and measures to manage this offering. However, across the three groups, different 'versions' of incremental innovation co-existed and were at times heatedly debated among the different groups. Kowalkowski et al. (2012) find something similar as 'disjointed incrementalism' at internal exchanges in the

context of service infusion into manufacturing, and Aarikka-Stenroos and Jaakkola (2012) identify ‘value conflicts’ in the development of knowledge-intensive business services.

Within ChemCo, the leading quality of Technical Group’s innovative efforts across projects was ‘can it be designed’, whereas for Sales it was ‘is it commercially viable’. Ostensibly, this was a reasonable division but occasionally sales personnel suspected that members of Technical were pursuing innovative solutions that could be too elaborate or expensive for customers:

> I think we all come to work with the idea that we will find an innovative solution to our customers’ problems that’ll ultimately differentiate and therefore set us apart in a positive way from our competition…. Now, that’s the ultimate aim but you also have to accept that each different department have distinctly different drivers to reach that goal. And therefore those departments, while working towards the same core goal, the routes they take to it are completely different. (Brian, ChemCo Business Developer)

The extent to which sales personnel contrasted the Technical Group’s understanding of innovation with their own was surprising given how close they were to their laboratory colleagues in education and background. For Technical the chemical work conducted had the sought-for quality of innovativeness and adequately solved the problem at hand. Technical specifications were agreed in the company’s projects database and formed the technical group’s version of the project. The project database did not give the Technical Group clear insights into customers’ user experiences or the commercial significance of individual projects.

Differences in understandings between Sales and Technical of what incremental innovation meant tended to be unresolved when global devices, such as the projects database and its value/risk matrix, were relied upon – as ChemCo’s CEO Richard put it, “they are hiding

behind the database". It was only when conflicts in interpretations came to the surface that technical and sales personnel were compelled to discuss what it meant for a chemical product to display the quality of innovativeness, and how this quality should inform the respective groups' contributions to solving a client's problem. However, with "salespeople in constant firefighting mode and Technical [being] a bottleneck", as Richard put it, senior management questioned just how much time could be afforded to align perspectives around innovation.

Our data also show different versions and valuations of incremental innovation at the sales/client interface. These differences were both between ChemCo and their customers and between the customers' local oil field representatives (asset managers) and their global representatives (corporate purchasing managers). One observed meeting with ChemCo and one of their biggest customers (Oil1) revolved around innovativeness as a focal quality of their exchanges. A procurement manager scrutinized ChemCo's claims of 'being innovative' as means of delivering value specifically in connection with their CMS contract. ChemCo managers were at pains to demonstrate proof of 'being innovative' in the chemical services delivered across a number of different projects in the agreed work program. This meeting, which was contentious and heated, indicated that if the CMS contract included ChemCo's ability to 'drive continuous improvement', this was not easily demonstrated or delimited.

In order to provide evidence of ChemCo 'being innovative', a key account manager needed to persuade the customer's lead chemist and procurement specialist in their corporate roles and the asset managers locally of the added value of an innovative product. Locally, ChemCo account managers were assessed for minimizing disruptions to the asset manager's processes (or 'keeping the oil flowing'). Their familiarity with clients helped ChemCo account managers ascertain how much disruption – through field tests or interventions in chemical regimes – an asset manager was willing to accept, and they were adept at negotiating a balance between the day-to-day maintenance of the oil production and their innovation

efforts, for instance as driven by regulation. KPI scores given to ChemCo by local asset managers were often correspondingly high. Financial incentives for contracts were asset-by-asset, so also locally focused. However, from the perspective of Oil 1's procurement performance manager Andreas, this local focus meant that ChemCo "was not focusing on the big issues but was reacting to production", and he expressed doubt that the KPI measures used were able to incentivize and reward innovation adequately. He wanted global models that drove profit and shareholder value through benefits attributable to awarding a CMS for the innovation service per se, rather than the deployment of innovation by means of ad-hoc projects and local relationships.

To summarize, ChemCo and its oil company customers face two problems: First and at the local level, defining and valuing the benefit of incremental innovation in projects, interventions and treatments at the customer's production facilities, which often required substantial trade-offs. Second, and globally, in making re-usable some dimension of incremental innovation, extending to the design of incentives so that the definitions and measures of value can be made visible and re-used, for example in quarterly review meetings or tender documents. By organizing the specific exchanges of chemicals or chemistry services as projects, incremental innovation is moved along as an object of exchange, though represented by multiple qualities. Through several business processes – the CMS, the internal ordering process and database, the value matrix, and customers' KPI scorecards – this object of exchange is broadly circumscribed in ways agreed across the industry. However, our findings demonstrate that capturing, standardizing and valuing incremental innovation remains contentious among the stakeholders involved, and that these processes are only imperfectly contained by contractual arrangements on the one hand and existing relationships on the other. The next Section analyzes our empirical findings in the light of the trading zone concept and draws four summary propositions.

5. DISCUSSION AND IMPLICATIONS

5.1 Summary of the Findings

Our findings shed light on the question of how to make incremental innovation as a business service tradable at the buyer-seller interface. As is the case in other industries, oil companies offer medium-term CMS contracts as a way of procuring problem-solving and innovation services and giving supplier companies the opportunity of acquiring detailed operational knowledge on customer processes (Aarikka-Stenroos and Jaakkola 2012; Zhang et al. 2013). Beyond these contractual arrangements, social capital was prominent and mainly fostered through co-locating ChemCo's account managers at client sites (Kohtamäki et al. 2013). However, we found that actors became concerned not only with co-creating business services through resource combining and the sensing and seizing of value-adding opportunities, as other researchers have assessed, but also with devising ways in which these can be exchanged. Comparing our empirical findings to the theoretical notion of trading zone, we argue that our actors maintained trading zones in order to make the business service of incremental innovation exchangeable, and that these helped cope with the three points of tension: (1) Differences in expertise between oilfield chemists and the users of their services and thus different perspectives of uncertainty; (2) Contending simultaneously with relatively underspecified CMS contracts and local short-term needs; (3) Production facilities and chemical regulation regularly posing novel problems with significant commercial consequences. In the face of these challenges, actors negotiated multiple representations of incremental innovation as a business service. Similarly, they negotiated multiple ways of measuring its costs and benefits in terms of commercial rankings, material costs, lab hours and KPIs. At each coalescing around these processes and devices, agreeing what was to be exchanged involved one group explaining the benefits of a project to another group, such that

the issue of ‘what is being exchanged’ continuously dissolved into that of ‘what is the value of the exchange’.

5.2 Conceptual Contributions

Valuation is central in identifying this paper’s theoretical implications for marketing and purchasing innovation services in a BTB context. The interactions we presented above take place in and help shape spaces where the qualities of the exchange object and its value are not fully resolved, but where this lack of resolution offers some benefits in the continuous co-development of innovative solutions.

In terms of BTB services marketing, our attention is drawn from an organisation’s capabilities and relationships and to actors’ interactions and designs of a space for exchange. The space offers multiple objects, agreements, measures, protocols and review processes that together provide a focus for negotiation and debate. As with other knowledge-intensive BTB services, in our case actors face a range of contingencies and unforeseen problems, which the provision of incremental innovation should militate against (Kowalkowski et al. 2012). Maintaining multiple measures allows actors to format incremental innovation sufficiently for exchange but also keeps it open and adaptable to answering future contingencies. Following the principle of abduction, we propose:

P1: Trading zones are characterized by multiple measures and representations of innovation as a business service, by which actors negotiate and qualify the service across its production, exchange and use, allowing them to maintain capabilities consistent with those measures.

Coping with uncertainty by localizing the interaction had emerged as a theme in previous empirical work on trading zones. In addition, the disconnect between global standards and

local contingencies proved significant in our case. Typically, trading zones emerge in settings where global coordination has not (yet) replaced local getting-by, as in the cases of Kellogg et al. (2006) or Girard and Stark (2002). Ours is a mature industry, though characterized by substantial local uncertainties. The measures, representations and tools we found – for instance ChemCo's projects database and the oil customers' KPI matrices – could acquire global or corporate-wide status as they were made operational in terms of ordering and ranking calculations. Often, they were bounded by medium-term contracts for innovation services, which transaction costs economists have previously studied (e.g. Gilson et al. 2009). However, in the trading zones, the contracts and ranking tools were not taken as given solutions to making an exchange, but rather negotiated and complemented with localized, situation-specific knowledge that allowed actors cope with local contingencies. Social capital, relationships and interactions mattered (Kohtamäki et al. 2013; Zhang et al. 2013), but they mattered mainly by providing access to multiple and negotiated representations for the exchanges taking place in the zone, which supported the necessarily incomplete contracts. We therefore postulate:

P2: The multiple measures and representations, which populate trading zones, emerge over repeated exchanges somewhere in between re-usable, transferrable and global or corporate templates, and relationships and interactions associated with specific projects.

Measures and representations remained contested locally, and individuals often found ways to circumvent them. The provision of innovation services can only continue if actors restrict their insights and understanding of others' expertise and thus avoid the problems of fully translating perceptions of value and uncertainties. Information asymmetries are both unavoidable and necessary in these situations (Kohtamäki et al. 2013). Analytically, we uncovered processes by which in the face of long-established commercial exchange and relationships, actors carefully protected their versions, logics or framings of incremental

innovation, especially as these were manifest as valuations. This is a benefit pragmatically of a trading zone, of restricting the scope of interactions around the exchange itself. We propose further:

P3: Trading zones focus the interactions typical of business-to-business exchanges, allowing actors restricted insights into one another's expertise, mediated by measures and representations of an exchange's intended benefits.

By focusing actors on exchange, the trading zone allowed for temporary bracketing of differences and a 'getting on' with the problems at hand. In our case, chemistry was being made and deployed fairly efficiently, and the oil kept running. At the same time, the trading zone also allowed the different groups of Technical, sales and purchasing to articulate their awareness that coordination was a 'work in progress'. The multiple processes came together at specific stages of a process, such as project approval in ChemCo and quarterly reviews between ChemCo and its clients, where actors 'un-bracketed' and faced the question of value. Thus:

P4: Trading zones compel actors to demonstrate their ways of valuing incremental innovation at specific moments during an exchange process, allowing a documented accumulation of case evidence project-by-project and so reinforcing a tendency towards incremental innovation.

5.3 Practical Implications

Our practical implications refer to marketing and purchasing practices in business-to-business exchanges. ChemCo would claim to be agile in devising innovative solutions, especially in its Technical Group (Kowalkowski et al. 2012), and its key account and business development

managers have clear capabilities in ‘sensing, seizing and reconfiguring’ value offerings (Vargo and Lusch 2011; Kindström et al. 2013). But making exchanges still causes problems (Cova and Salle 2008). The trading zone is of importance to marketers and procurers of incremental innovation because it compels them to define their exchanges in terms of benefits, rather than in the technical consequences and expert vocabulary of their production and use. Furthermore, we expect benefits to be measured in terms of negotiable rules of thumb rather than ex ante service specification. Our emphasis on exchange and local coordination does not detract from the importance of relationships and networks especially in knowledge-intensive service contexts, but complements it by focusing on how relational contexts are interlaced with episodes of exchange. These episodes need marketers’ attention especially where they harbour potential sources of conflict. We direct marketers’ and purchasers’ attentions to the representations, tools and measures that constitute the trading zone and to maintaining these as valuable complements to contractual arrangements and social capital.

5.4 LIMITATIONS AND FUTURE RESEARCH

In this paper, we have developed the concept of trading zones in two directions: (1) by forefronting the issue of valuation in the business-to-business market setting of innovation services; and (2) by examining this in a mature industrial setting, so providing a clearer focus on incremental innovation. We followed a logic of analytical rather than statistical generalization and thus encourage researchers to test our four postulates set out in Section 5.2 (above). We also encourage future research to specifically examine the role of marketers in populating trading zones with their additional mediating measures and representations. Marketers as an identifiable profession played a minor role in our case analysis. Senior chemists, key account managers, sales personnel, business development managers,

procurement managers and asset managers mediated relationships instead. Finally, our research indicates a potentially very fruitful stream of inquiry in which innovation occurs through deliberately restricted understandings among actors involved in the co-creation of value. Given our findings, relationships and interactions that are left acknowledged as misaligned could well be shown to stimulate rather than stymie co-creation.

6. CONCLUSION

Our empirical setting of a mature science-intensive industry involves exchanging incremental innovation as a business service through different contractual arrangements, across a number of relationships and in various project guises, with a view to solving future problems that are only known in outline at present. The trading zones we examine in this paper emerged as actors coped with: the heterogeneity in problems to be solved; different professional knowledge bases across technical, sales and customer groups; and differences in recognizing the value of innovative interventions at local and global levels. We demonstrated that trading zones allow actors combine in local and flexible ways global kinds of relations, activities and devices in order to make exchanges. Trading zones allow for episodes of interaction where different meanings, interests and values can be surfaced, negotiated, and crucially also bounded and maintained. As coordination mechanisms, they allow actors to cope with considerable uncertainty and difference being valuable for those industrial settings where knowledge-intensive services such as R&D or innovation have become the focal object of business-to-business exchanges.

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Table 1: Data collection

Data source	Project Duration	Research participants	No. of inter-views	Documents
Project 1	2 months	Non-CMS customer, sales, Technical	2	Email trail & project database
Project 2	1 year	Account manager, consultant acting for customer, customer lead chemist & asset manager	2	Email trail & project database
Project 3	1 month	Technical and customer lead chemist	2	Email trail, project database & lab tour
Project 4	2 years	Technical support and customer	1 (with 2 inter-viewees)	Email trail & project database
Project 5	2 months	Technical support	2	Email trail, project database & marketing materials
Project 6	8 years and ongoing	Service company	1 (3 hours)	Email trail & project database
Project 7	2 months	Operations, sales, technical services	3	Email trail & project database
Non-project specific inter-views	Duration of the field work	ChemCo senior managers	7	Organizational charts and project database
Observation at two quarterly review meetings	As part of CMS contracts	Senior Sales Manager, Key Account Manager, Client Buyer, Client Lead Chemist, Asset Managers	2 meetings observed	View of KPI scores from customers' asset managers
Follow-up interviews with key players from quarterly review meetings	1 week after review meeting	Senior Sales Manager, lead chemist, lead buyer	2 (3 attendees at each)	
Conferences on Oilfield Scale and Oilfield Corrosion	Four days	Over 100 delegates	Many short conversa-tions	Sales materials from exhibition, scientific papers and presentations
Analysis of contracts	Tender document for CMS	Senior Sales Manager	1	4 large folders

Table 2: Interviewees (pseudonyms)

Name	Position	No of interviews
CHEMCO		
Alice	Technical group leader	1
Brian	Business Development manager	3
Daniel	Key account manager	1
Garreth	Technical Group senior manager	3
Richard	CEO	5
Chris	Key account manager	1
Ewan	Technical group leader	1
Grant	Purchasing and Quality senior manager	2
Gregor	Technical Services Group	1
Stephanie	Technical Services Group	1
Michael	Key account manager	2
Robert	Technical Services group	1
Ryan	Technical Services group	1
Simon	Technical Services group	1
		24
Customers Oil 1 and Oil 2		
Joe	Lead production chemist Oil 1	1
Andreas	Procurement specialist Oil 1	1
Kevin	Lead production chemist Oil 2	1
Damien	Procurement specialist Oil 2	1
		4

Table 3: Qualities of incremental innovation

Project	Initiated by	Value proposition	Supplier uncertainties	Buyer uncertainties
1	Business develop-ment	A minor adaption on a new platform	Does customer form a favorable impression through this exchange?	Is it a new product for regulation?
2	Consultant acting for customer	Survey & treatment plan for resolving one problem across many platforms	Getting customer to appreciate that problem requires an intervention	Prioritizing across platforms, refurbishment plan
3	Customer	A solution to an unanticipated urgent problem	One-off project, secured by knowing the buyer, reputation risk on being able to solve the problem	Tough economics on refurbishing and producing from a mature field
4	Customer in context of CSM	Interactive product development	Enhancing technical reputation with buyer	Can the supplier do this, how much technical support will they need, regulatory change
5	Group marketing manager	Demonstrating a capacity to adapt established products to work at deep water	Positioning in market, mapping approximately onto user requirements	Risk of introducing a new product, disruption, interactions with other treatments
6	Lead chemist	A new way of releasing production chemistry directly into reservoir	Establishing a marketing channel, a delivery channel, and a reliable production process	Will the product work, will suppliers collaborate effectively, interaction effects
7	Business develop-ment	Solving an urgent problem with minor adaptation	Internal documentation of licensed products, willingness to order & stock small quantity of a specialist base chemical; can the product be made?	Speedy response needed; buy a second-best from another chemicals company